Major, K., Smith, D., & Migliano, A. B. (2018). Co-Managers or Co-Residents? Indigenous Peoples' Participation in the Management of Protected Areas: A Case Study of the Agta in the Philippines. *Human Ecology*, *46*(4), 485-495. https://doi.org/10.1007/s10745-018-0007-x

Co-managers or co-residents? Indigenous peoples' participation in the management of protected areas: a case study of the Agta in the Philippines

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Abstract

Indigenous peoples' participation in the co-management of protected areas is recognised as essential for conserving both cultural and biological diversity. While this practice is increasingly common, few studies have quantitatively evaluated the efficacy of these initiatives. Here we examine levels of knowledge and involvement among the Agta, a hunter-gatherer population who co-manage the Northern Sierra Madre Natural Park, the largest protected area in the Philippines. We find that the Agta generally possess low levels of knowledge about the protected area they are supposed to co-manage. Participation in park management is hampered by several factors, including a lack of cultural sensitivity regarding the Agta's foraging lifestyle among park officials and little political will to realistically empower and support the Agta as co-managers. Recommendations to strengthen Agta participation – and indigenous peoples' participation in protected area management more widely – are made to help protect the world's remaining cultural and biological diversity.

Keywords: *Indigenous peoples, co-management, protected areas, Philippines, conservation*

Introduction

Protected areas are becoming increasingly important for conserving global biodiversity. Due to the escalating rate of deforestation and exploitation of natural resources, protected areas provide an opportunity for biodiversity to be conserved and utilised sustainably (Harmon *et al.* 2008). Protected areas often overlap with areas of cultural diversity, meaning that protecting both biological and cultural diversity frequently occur in tandem (Maffi 2005) as areas rich in biodiversity are often inhabited by indigenous peoples (Toledo 2001). It is therefore vital to work with the indigenous communities living within the protected area when developing and managing these areas.

Protected areas have been used to guard specific areas for centuries, such as ritual land or game reserves, but it is only during the past few decades that they have been used as a vital conservation strategy in safeguarding biodiversity. The number of protected areas has thus dramatically increased (Watson *et al.* 2014). Due to this rapid growth, they are having a larger impact on the local communities living in or near the protected areas. As a consequence of this overlap, and due to criticism of management practices which disregarded human rights (such as displacement and ignoring local development needs), the purpose of protected areas now includes supporting peoples' livelihoods (Agrawal & Redford 2009; Borrini-Feyerabend *et al.* 2004; Watson *et al.* 2014).

One particular group of people affected are indigenous peoples. Despite lacking a universal definition, indigenous peoples are commonly described as communities which consider themselves as possessing a separate cultural heritage from neighbouring societies and having historical, often pre-colonial, continuity with their land (for a more detailed discussion on the rights of indigenous peoples, see the United Nations Declaration on the Rights of Indigenous Peoples (UN 2007)). As the framework of protected areas has changed, so too has the role of indigenous peoples in the development and management of these areas. While previously it was common practice to relocate indigenous communities or to restrict their resource access (Borrini-Feyerabend *et al.* 2004), they

80 are now considered an integral element of the management of protected areas and their
81 involvement is actively sought (Colchester 2004).
82 As many state-owned top-down approaches to resource management have been
83 unsuccessful, co-management initiatives have been increasingly applied to overcome their
84 limitations (Persoon *et al*. 2003). Co-management is now a globally applied approach to protected
85 area management, and is broadly defined as the shared responsibilities and joint decision-making of
86 key stakeholders (Berkes 2009). Although co-management is being increasingly adopted, the
87 approach possesses several limitations, such as: concerns over legitimacy of the co-management
88 initiative weakening compliance (Jentoft 2000); human rights issues still existing despite local
89 community involvement (Berkes 2009), and; conflicts of interest between stakeholders inhibiting
90 successful co-management (Persoon *et al.* 2003).
91 Despite these problems, co-management gives indigenous peoples the opportunity to
92 participate in park management. Often referred to as 'rightsholders' in many countries ("actors
93 socially endowed with legal or customary rights with respect to land, water and natural resources"
94 (Borrini-Feyerabend *et al.* 2013, 15)), indigenous peoples' participation in co-management respects
95 their rights to ancestral land and protects their livelihoods, and in theory also benefits the protected
96 area. Such benefits include increased knowledge of local flora and fauna among all parties involved
97 through information-sharing (Berkes 2009) and increased protection of biodiversity through
98 indigenous stewardship (Larsen and Oviedo 2006).
99 Co-management can be difficult to implement successfully. Indigenous communities are not
100 always given sufficient training on co-management or information about the protected area (Young
101 and Horwich 2004), and therefore do not have the power or resources to co-manage effectively.
102 This reduces their participation and weakens their influence on park decisions. Involvement can also
103 be undermined by other co-managers, such as government officials and Non-Government
104 Organisations (NGOs), who may speak on their behalf (Kothari 2008), or only partly acknowledge
105 their input (Cundill *et al.* 2013). Furthermore, differences in cultural practices between indigenous

peoples and other stakeholders can be problematic during decision-making processes (Premauer and Berkes 2015), reducing the impact of their involvement.

One indigenous group who face these challenges are the Agta, co-managers of the Northern Sierra Madre Natural Park (NSMNP) in the Philippines. Theoretically, the Agta are well-represented as co-managers of the park (see 'Philippine Legislation Surrounding Indigenous Peoples' section) and have been labelled as "guards of the mountain ranges…protectors of the forest" by government officials (Minter 2010, 257). However, previous research suggests that they have limited understanding of the protected area and little decision-making influence (Minter 2010; Minter *et al.* 2014). Here we explore these issues in greater detail and examine the Agta's participation as co-managers; specifically their knowledge on park rules, their rights as indigenous peoples and their involvement in park management. We employ a combination of qualitative semi-structured interviews and quantitative statistics to explore patterns of knowledge and participation. This study also explores the individual and social factors which influence knowledge and involvement, including sex differences, age, geography, social structure and involvement with external agencies. These results will provide a solid empirical foundation from which initiatives to increase Agta participation – and indigenous peoples' participation in protected area management more widely – can be built, with the overall aim of protecting the world's remaining cultural and biological diversity.

Population, Legislative and Geographic Background

Ethnography

The Agta are an indigenous Filipino population from northeast Luzon, believed to have descended from the original colonisers of the Philippines ~35,000 years ago (Bellwood 1999). The Agta's appearance is distinct from non-Agta Filipinos due to their dark skin, curly hair and small body size. They predominantly practice a predominantly hunter-gatherer lifestyle, and as with many other hunter-gatherers (Boehm 2001), they are egalitarian and lack positions of authority (some camps have 'chiefs', but these are appointed by external organisations). This study focuses on the Agta residing in the municipalities of Palanan (~1,000 individuals) and Maconacon (~250 individuals).

Camp sizes range from single dwellings to larger camps of up to 26 houses, with an average of seven houses. The Agta are semi-nomadic and move frequently between camps, and as such have little material wealth.

Although the Agta live in close proximity and frequently interact with non-Agta, conflicts are not uncommon. Throughout history the Agta have been a minority group and often discriminated against (Headland and Headland 1997). The principle reason for this is the difference in the Agta's lifestyle and culture, which is perceived as unusual among many non-Agta (a more-recently colonised agricultural population), resulting in feelings of hostility (Minter 2010). Interventions aimed to help the Agta have occurred, although these efforts are often misguided and fail to consider the Agta's distinct way of life (Minter 2010). There is also conflict over resource use, with the Agta feeling that the non-Agta are impacting their livelihoods by over-exploiting resources. Despite these conflicts, many interactions between the Agta and non-Agta are mutually beneficial, such as trading foraged goods for agricultural products (Peterson 1978).

Philippine Legislation Surrounding Indigenous Peoples

The inclusion of indigenous peoples in the co-management of protected areas in the Philippines was established in 1992 with the National Integrated Protected Areas System (NIPAS) Act (La Viña *et al.* 2010). This act is the overarching framework for managing the Philippines' protected areas and acknowledges the rights that indigenous communities have to continue living on their ancestral land. To ensure that indigenous peoples are included as co-managers, NIPAS imposed the creation of a Protected Area Management Board (PAMB) for each park. PAMB comprises of representatives from indigenous communities, as well as government officials and NGO representatives, and is responsible for making decisions which benefit both the park and its residents (DENR 1992).

The rights of Filipino indigenous peoples are further recognised through the Indigenous Peoples' Rights Act (IPRA) 1997, which created and gave responsibility to the National Commission on Indigenous Peoples (NCIP) to represent and protect the country's indigenous peoples. A

prominent feature of IPRA 1997 was that indigenous communities could claim a Certificate of Ancestral Domain Title (CADT) which legally recognises the indigenous peoples' ownership of ancestral land. An issue preventing successful CADT claims is that ancestral lands often overlap with protected areas, meaning that many CADT claims are unsuccessful as this would conflict with the protected area objectives outlined in the NIPAS Act (La Viña *et al.* 2010; for a background on the Agta's CADT claims see Minter, 2010, 261-263). At the time of fieldwork the Agta residing in the NSMNP had not yet formally received a CADT.

Northern Sierra Madre Natural Park

Previously designated as a Wilderness Area in 1979, the NSMNP was officially established in 1997 (Presidential Proclamation 978). Located in Isabela province, northeast Luzon, the NSMNP is the largest protected area in the Philippines (359,496 hectares; La Viña *et al.* 2009), and approximately 23,000 people (including Agta) reside in the park (Minter 2010). It is home to numerous endangered and endemic species: 48% of mammals, 29% of birds, 72% of amphibians and 56% of butterflies recorded in the park are endemic to the Philippines (DENR 2001). Therefore, the park is considered one of the most important protected areas in the Philippines (DENR 2006).

The park contains valuable resources which are often unsustainably extracted by both local and non-local Filipinos, threatening the park's biodiversity. These include numerous wildlife species, rattan and swiftlet nests (Minter *et al.* 2014), and it is common for residents to use chainsaws, guns and electric- or poison-fishing methods. Another major issue is logging; 20,000-35,000 cubic metres of timber is illegally extracted each year which the DENR do little to combat (van der Ploeg *et al.* 2011). To control resource use a zoning system was implemented. A 'strict protection zone' covers the majority of the park which permits only the Agta to obtain resources through "traditional resource use" (DENR 2001, 73). Other zones include: a 'sustainable use zone' permitting sustainable resource extraction by all; a 'multiple use zone' allowing rural development; and a 'buffer zone' surrounding the park to prevent encroachment (DENR 2001; Minter 2010). Despite this system, the

183 park receives poor governance and the rate of unsustainable resource use is not adequately
184 addressed.
185 As mentioned previously, the park is managed by PAMB which is governed by the
186 Department of Environment and Natural Resources (DENR). PAMB is responsible for developing and
187 implementing policies which meet the parks overall goals, including habitat and biodiversity
188 protection and facilitating community-based resource management. Examples of specific topics
189 discussed at PAMB include: CADT, resource extraction, park projects and logging (Minter *et al.*
190 2014). PAMB contains 36 members representing various sectors, including local governments, NGOs
191 and indigenous communities. Twelve PAMB members are Agta representatives, all of whom are
192 considered chiefs (and also all male). Four meetings occur each year; all members attend two of
193 these, while the executive committee (comprised of nine seats, one of which is an Agta
194 representative) meet a further two times annually. In theory any park related decisions need the
195 Agta's consent before implementation. However, Agta attendance is low. On average only four of 12
196 Agta attend these meetings, and when they do attend they rarely contribute to discussions.
197 Participation in PAMB is limited by numerous factors, including their illiteracy and low
198 socioeconomic status (Minter *et al.* 2014).
199 Since the park's formation, various NGOs have worked with the DENR, helping shape its
200 management plan and delivering projects promoting sustainable resource use. Previous agencies
201 included PLAN International (PLAN) and World Wide Fund for Nature (WWF), although their
202 involvement was only short-term. PLAN in particular worked closely with the Agta, helping maintain
203 the park's natural resources while ostensibly enhancing their quality of life via community-based
204 projects (Araño and Persoon 1998). More recently, Agta participation in park projects has decreased,
205 and agencies active in the area, such as Conservation International and Mabuwaya Foundation,
206 focus mainly on biological conservation issues. Nonetheless, the NCIP still work with the Agta,
207 particularly regarding land rights, and collaborate with the DENR to provide opportunities for the
208 Agta to participate in park projects.

Methods

Data Collection

Two forms of data collection – surveys and semi-structured interviews – were employed to assess the Agta's knowledge of, and involvement in, NSMNP co-management (see SI for survey and topic guide). Surveys were conducted on all adults in camps visited (*n*=308, average age=36.6, males=151) and assessed the Agta's knowledge and perceptions of the NSMNP through a series of short closed-ended questions. These questions focused on awareness of living in a protected area, park zoning system, IPRA 1997, CADT and agencies who previously or currently work in the park. Survey data were collected in 20 camps, 13 in the Palanan municipality (*n*=240) and seven in Maconacon (*n*=68). Camp sizes ranged from four to 49 adults, with an average of 15.4.

Semi-structured interviews explored these issues in greater detail. Four individuals from each camp were interviewed (except in one large camp where eight individuals were interviewed, one small camp with only three interviewees, plus another small camp where interviews were not conducted). Preference was given to chiefs and individuals who were willing and available to participate. Equal numbers of males and females were interviewed in each camp. Interview questions were based on six themes: overall understanding of the NSMNP and its rules, park zoning system, CADT, PAMB, agencies working in the park and Agta involvement in park projects. Although a topic guide was used, additional questions were asked depending on individual responses, resulting in some questions differing between participants (hence slight variations in sample sizes reported below). Interview data were collected from 19 camps, 12 of which were in Palanan (*n*=52) and seven in Maconacon (*n*=27).

Surveys and interviews were conducted in private to prevent responses being influenced by others. Data were collected with the help of a translator who spoke the local dialect. Questions were asked in English by the researcher and then translated into the local dialect (Paranan, Tagalog or Ilocano). Prior to data collection, translators were trained on the context of the questions to ensure that they understood why these questions were asked and to check that the meaning remained the

same after translation. Data collection occurred between February and October 2014. Ethical approval was granted by University College London Ethics Committee (UCL ethics code 3086/003). Informed consent was obtained from individuals and fieldwork permission granted by the DENR.

Statistical Analysis

To assess knowledge, participants were assigned a score out of 11, calculated by summing their survey responses, with a point given for each agency or other park-related subject known. Zero points were given if the participant had not heard, or were unsure if they had heard, of a topic. To analyse involvement, independent analyses were conducted for each of the three questions. Answers were converted to a binary variable for each question and all 'don't know' responses coded as missing. This was employed for the involvement analyses but not the knowledge analyses due to greater ambiguity over a 'don't know' response regarding involvement (i.e., a 'don't know' response to recognising an agency was interpreted as not knowing it, while a 'don't know' response to feeling involved in park decisions is different from unequivocally stating no involvement).

Analyses employed multi-level models to control for the non-independence of data points (individuals clustered within camps; Kreft and de Leeuw 1998). For each analysis, model fit was compared (using AIC values) to determine whether the data possessed a multi-level structure. Linear regressions were employed for knowledge, while logistic regressions were used for involvement analyses. Independent variables included age, sex, distance from main town, chief presence, whether the camp had an evangelical church and municipality (Palanan or Maconacon). Analyses were conducted in R (R Core Team 2015) using the package *lme4*.

Data from semi-structured interviews were coded according to participant's park knowledge, involvement and their role as co-managers. Percentages are used to show trends and quotations utilised to add context.

Results

Agta's Knowledge of the Northern Sierra Madre Natural Park

Knowledge of park rules and associated legislation was generally low among the Agta (table 1), with an average knowledge score of 4.2 out of 11. The percentage of individuals who knew each survey knowledge question is displayed in figure 1.

Only 44% of individuals surveyed were aware they were living in a protected area. Similarly, only 21 of 69 (30.4%) individuals interviewed felt they understood what a protected area was, while only nine of these 21 (42.9%) who attempted to define it were broadly correct. Two activities were identified by the majority of individuals interviewed as being illegal in the park: electric/poison/dynamite fishing (84.1%) and logging (77.2%; *n*=79).

35.4% of individuals surveyed recognised PAMB, while only five of 26 (19.2%) interviewees who had heard of PAMB felt they understood its purpose. Of the three individuals who tried to define it, only one possessed an adequate understanding. Despite this, four individuals interviewed claimed to have previously attended a PAMB meeting. Although their experiences were generally positive, one individual said "they are supportive in what I say, but they do not act upon this". After PAMB was explained to interviewees, 85.7% of 77 individuals said that they would like to attend a PAMB meeting if given the opportunity.

Most individuals surveyed were aware of one or more government agency or NGO who had worked in the park (87.7%). The best-known agencies were the DENR, PLAN and NCIP, while the least-known were Conservation International, WWF and Mabuwaya Foundation (figure 1). Most individuals expressed that the DENR (28 out of 34) and the NCIP (10 out of 11) were effective, although a few mixed responses were given. Comments included "there are some DENR employees who keep the forest and ocean good, but there are some employees who are doing the illegal activities. It makes me feel sad as they are only pretending to help protect the forest and ocean", and "[the NCIP] are always promising but nothing happens".

285 The majority of surveyed individuals did not know which zone they were residing in (98%),
286 and had not heard of a CADT (64.6%) or IPRA 1997 (76.3%). 11 of 76 (14.5%) interviewees believed
287 they knew what a CADT was, although only eight individuals correctly described one.
288 Next, the factors influencing knowledge were explored. As the null multi-level model was a
289 better fit (null AIC=1449.1; null multi-level AIC=1401.4) multi-level models were used. In a
290 multivariate model including all independent variables (see table 1 for descriptive statistics), both
291 individual- and camp-level factors predicted knowledge (table 2). Older participants were more
292 knowledgeable, with approximately a 20-year increase in age associated with a one unit increase in
293 knowledge. Participants residing in camps with a chief were also associated with increased
294 knowledge, with a score 1.23 higher relative to camps without a chief. On average, males possessed
295 an additional 0.83 knowledge points. Furthermore, camp location was associated with knowledge,
296 with an additional 10 kilometre increase from the town predicting a decrease in knowledge by
297 approximately one unit (figure 2).

298 **Agta Perceptions of Involvement**

299 Of the 308 individuals surveyed, 271 individuals responded that there was an individual or
300 agency they could report illegal activities to (chiefly electric/poisoning fishing and illegal logging).
301 After removing nine 'don't know' responses, 90.6% of individuals had someone to report illegal
302 activities to, while 9.4% had no-one. The most common person or agency identified were *barangay*
303 (district) officials (58.5%) and Agta chiefs (18.7%).
304 A small proportion of interviewees had previously reported an illegal activity (23.4%; 11 out
305 of 47), although the outcome of this reporting varied. One individual discussed how they reported a
306 *barangay* official electric fishing to the *barangay* captain but no action was taken, saying "I feel
307 angry that nothing happened and that there's no-one else to report illegal activities to". Other
308 individuals discussed how their *barangay* captain attempts to stop illegal activities but has little
309 impact, with one Agta saying "the people don't listen". Although the majority of individuals surveyed
310 were able to identify who they could report illegal activities to, 85.7% of 28 interviewees would not

311 actually make a report. The most common reason for this was fear of retaliation from the person
312 performing the activity, with some individuals commenting “I am worried that the person doing the
313 illegal activity will kill me”, “the non-Agta would get angry with me”, and “we don’t want quarrelling
314 or misunderstanding, so if we see cutting of trees we just ignore it”.

315 The factors influencing whether the Agta identified an individual or agency to report illegal
316 activities to were explored. The null multi-level model possessed greater model fit (null AIC=187.9;
317 null multi-level AIC=179.4) so was employed. No variables were significantly associated with
318 identifying someone to report to (table 3; although females and individuals from camps with a chief
319 were slightly more likely to name someone).

320 Of the individuals surveyed, 101 individuals felt they had enough information on the NSMNP
321 and its rules, while 101 did not (50% each; after removing 106 ‘don’t know’ responses). In contrast,
322 after removing 59 ‘don’t know’ responses, 203 (81.5%) individuals surveyed responded that the Agta
323 had enough influence on park management, while 46 (18.5%) felt they did not. Thus, perceptions of
324 Agta influence over park decisions were ~30% points higher than perceptions of whether individuals
325 had enough information.

326 Factors influencing perceptions of having enough information were explored. Multi-level
327 models were used as the null multi-level model was a better fit (null AIC=282; null multi-level AIC
328 =271.5). Individuals from camps with a chief were approximately 2.5 times more likely to state they
329 had enough information than those without a chief (table 3). No other effects were significant.
330 When exploring perceptions of Agta influence regarding park decision-making, the two null models
331 were equivalent (null AIC=240.3; null multi-level AIC=241.1), so non-hierarchical models were used.
332 No variables in this analysis were associated with whether the Agta felt they had enough influence
333 over park decisions (table 3). To explore if there was an association between knowledge and
334 perceptions of involvement three additional logistic regressions were conducted; in each model
335 greater knowledge was associated with greater perceived involvement (table 4).

336

337 **Discussion**

338 According to the NIPAS Act and the NSMNP Management Plan the Agta are co-managers of
339 the NSMNP and should be actively involved in park management, yet the present research suggests
340 that this is not the case. These findings highlight that the Agta lack basic knowledge of the protected
341 area they live in, suggesting that they are unable to co-manage effectively. Indeed, fewer than half
342 of all individuals were even aware they were living in a protected area. These results have significant
343 implications for co-management plans and highlight the importance of quantifying participation in
344 these co-management schemes (Minter *et al.* 2014), as well as identifying recommendations for
345 future practice.

346 Given that the Agta are theoretically responsible for co-managing the NSMNP, the average
347 knowledge score was low (4.2 out of 11). Although many individuals were aware of at least one
348 agency working in the park, the majority of individuals had not heard of many aspects central to
349 successful participation in protected area management, such as IPRA 1997, PAMB, CADT or the
350 zoning system. These findings demonstrate that overall the Agta have a poor understanding of the
351 park and their rights as indigenous peoples. Both age and sex influenced knowledge, with males and
352 older individuals more knowledgeable than females or younger Agta. One explanation for these
353 differences could be that older males are invited to park-related meetings more frequently than
354 females and younger males. This gender bias was noted in previous research (Minter 2010) and
355 indicates little improvement of female participation over the past decade. Despite this, a large
356 percentage of females stated they would like to be included in PAMB meetings (~70%; although, as
357 noted by some women, child-rearing responsibilities can make attendance at distant meetings
358 difficult). Age may also influence knowledge as the older generation may have participated in early
359 park projects managed by PLAN, which were still remembered by older individuals despite their
360 project ending in 2002. Additional exploration of the association between age and knowledge
361 suggests that this may be the case, as the knowledge of individuals younger than ~30 years (and
362 therefore children during PLAN's presence) was lower than older individuals, after which knowledge

appears to plateau (figure S1). This suggests that earlier interventions which were inclusive of the Agta may have been more effective in engaging them with park issues. Indeed, interviews highlighted that the Agta were not updated on changes in park management, with one individual commenting "I don't know why they [PLAN] don't come here anymore".

The presence of a camp chief was also associated with increased knowledge. At face value this could be interpreted as chiefs disseminating information to camp-mates, therefore increasing overall camp knowledge. Descriptive statistics suggest that chiefs were more knowledgeable than non-chiefs (mean chief knowledge score=7 (*n*=7); mean non-chief knowledge score=4.1 (*n*=301)). However, this information may not be transmitted to camp-mates. When asked who informed them about illegal activities, only two individuals (of 48; 4.2%) identified a chief, whereas the most common responses were the DENR (39.6 %) and *barangay* captain (25%). Although further research is needed to fully determine how the Agta are informed on park issues, this suggests that chiefs do not often inform camp-mates. As is common among other egalitarian hunter-gatherers, individual Agta (including chiefs) have little authority to tell camp-mates how to behave as this would violate the egalitarian ethic of autonomy (Gardner 1991). Rather, Agta chiefs tend to act as mediators in disputes or as spokesmen to outsiders. Therefore, other factors associated with having a chief may enhance knowledge. For example, camps are encouraged to appoint chiefs by park agencies and church groups, and it is possible that these camps are informed by these external agencies more than camps without a chief.

Furthermore, only chiefs are selected as PAMB members (Minter 2010). These individuals are responsible for participating in park decision-making and are crucial for the Agta's involvement in park management. However, this system does not consider the Agta's egalitarian social system, in which group decisions are generally reached by consensus rather than by the opinions of a select few. This role of chief as primarily mediator rather than decision-maker was exemplified by one chief who, when asked about the decision-making process in camp, replied that "everyone has a voice, and whoever is the best they [will] follow, because even though I am the chief, it's not good if my

389 decision is the only one to be followed as I may not be right". Therefore, the current PAMB
390 organisation may not be the optimal system to empower the Agta as co-managers, potentially
391 limiting participation (in addition to other PAMB barriers; Minter *et al*. 2014).
392 The final factor associated with knowledge was distance, with individuals in camps located
393 closest to main towns possessing greater knowledge than more distant individuals. As park-related
394 meetings are mainly held in municipal towns, they are therefore more accessible to those living
395 nearer. Furthermore, distant camps have less contact with park officials due to the time and effort it
396 takes to reach them. Although the DENR and NCIP do occasionally visit distant camps, comments
397 made by the Agta suggest that they only visit if attending a meeting, engaging with *barangay*
398 captains or visiting plantations. One individual commented "they [DENR] have come to the camp
399 before but didn't talk to me. I don't know what they wanted". Although agencies may occasionally
400 visit areas near Agta camps, they rarely inform the Agta of park updates.
401 In contrast to knowledge, few variables affected the Agta's perception of their involvement
402 in park management. The main factor was that the presence of a chief was associated with an
403 increased probability of an individual stating that they had enough park information. As discussed
404 above, this chief effect is plausibly linked to the wider implications of having a chief (e.g., greater
405 external agency involvement). However, only 50% of Agta felt they had enough information on the
406 NSMNP. This highlights the need for information-sharing among all Agta, not just a select few. As
407 knowledge predicted involvement in all three domains, an essential first step towards greater Agta
408 participation would be to increase their knowledge and awareness of these issues.
409 Additionally, it is important to note that although most Agta identified someone to report
410 illegal activities to, very few individuals stated that they would actually make a report. This was
411 largely due to fear of retaliation from non-Agta, highlighting the underlying conflict and power
412 asymmetry existing between Agta and non-Agta. While some Agta do attempt to stop illegal
413 activities, this also demonstrates that the Agta are largely powerless to prevent these activities,
414 despite their role as co-managers.

Recommendations

It is evident from these findings that the Agta are not equipped or empowered as co-managers of the NSMNP, and that the current structure of PAMB is not an effective system to facilitate Agta participation. Therefore, it is suggested that an important first step in enhancing the Agta's role as co-managers would be to extend and restructure PAMB. Not only does previous research show that attendance and participation issues exist for Agta representatives at PAMB meetings (Minter *et al.* 2014), the present study demonstrates that appointing Agta representatives may be an ineffective method for information-sharing among the Agta. While chiefs may attend these (and other) meetings, their highly-autonomous egalitarian social system means that this knowledge is rarely transmitted to camp-mates. Implementing regular meetings regarding current park issues for all Agta in each municipality (alongside the existing PAMB meetings) may be a more successful strategy. The meeting should be attended by non-Agta PAMB members, and would give the Agta the opportunity to make joint decisions. Meetings on this scale would require great organisation, but attendance at similar meetings has previously been high (Minter *et al.* 2005). This style of meeting would permit a decision-making process analogous to everyday group decisions which may increase participation and empower the Agta as co-managers. Furthermore, unlike the current PAMB meetings (Minter *et al.* 2014) it is important that expenses incurred by the Agta attending these meetings are reimbursed to ensure that participation is not limited by the Agta's socioeconomic situation.

Secondly, the present study demonstrates the importance of knowledge in increasing the Agta's perceptions of involvement in park management, highlighting the need for all Agta to be regularly updated on park issues. The DENR should be responsible for this, and here we suggest that they update the Agta by regularly visiting Agta camps. Due to the distant location of camps and the large number of individuals (~2,000 Agta live in the NSMNP; Minter 2010), this may be logistically difficult, although it is advised to build upon existing structures. One option would be to implement a similar format to the current *barangay* meetings, which are meetings for residents to discuss local

441 issues and occur close to Agta camps. Additional data collected on the *barangay* meetings show that
442 they are frequently attended by Agta (72.4% of 76 Agta had attended one or more meetings).
443 Participation in these *barangay* meetings is also less sex-biased, with approximately equal
444 proportion of males and females attending. Although contributions are not exceptionally high (~40%
445 of individuals claimed to have actively contributed to discussions), the majority of Agta across all
446 *barangays* felt that their *barangay* captain would listen and take action if they raised an issue (95%
447 of 40), with one individual commenting that they were "proud to raise issues" at these gatherings.
448 This could be due to the familiarity and trust that the Agta have with the *barangay* captain who
449 attends all meetings. Therefore, it is essential that the same DENR representative chairs these
450 meetings to help facilitate trust between the Agta and the DENR, which is critical for effective co-
451 management (Berkes 2009).
452 Thirdly, it is important that women are equally informed and involved in park decisions as
453 men. Recent evidence has highlighted that conservation outcomes are improved if women are
454 involved in co-management of natural resources (Leisher *et al.* 2016). Additionally, as outlined by
455 the United Nations Sustainable Development Goals, gender equality is essential for long-term
456 sustainable development (United Nations, 2015). Therefore, women should be invited to park-
457 related meetings and female PAMB membership encouraged. Not only will increasing women's
458 participation reduce the divide in knowledge between the sexes, it is also more compatible with the
459 Agta's social system of sex equality (Dyble *et al.* 2015). In this system, many Agta women are
460 extremely active in the social and political lives of their communities and are often highly influential
461 decision-makers (see also Endicott and Endicott 2008).
462 Although these recommendations are needed to strengthen the Agta's role as co-managers
463 (see also Minter *et al*. 2014), it would be difficult to fully achieve an effective co-management
464 scheme without examining the wider social context. The Agta's lifestyle is still prejudiced against by
465 some non-Agta, so it is imperative that all park stakeholders are culturally sensitive to the Agta's
466 livelihood by not imposing their own standards on the Agta, but rather adapting their institutions to

maximise Agta participation (Page *et al.* 2018). While increased cultural sensitivity may help empower the Agta, greater Agta participation may benefit the park in other ways. For instance, many individuals interviewed mentioned using a '*gay-gay'* – a length of string tied over a river, traditionally used to prevent people entering an area after someone has died – in an attempt to prevent illegal activities such as electric fishing. Non-Agta are aware of *gay-gays* and generally respect them. Thus, in addition to the Agta's vast local ecological knowledge (van der Ploeg and van Weerd 2010), customs such as *gay-gays* can be embraced and encouraged to help protect natural resources.

The Agta are seen as 'guardians' of the NSMNP by park agencies (Minter 2010), yet they lack the knowledge, resources and support to even begin to attempt this, let alone succeed. Although many Agta harbour positive attitudes towards protecting the NSMNP, as a result of their socio-political circumstances they have no power to meaningfully effect change, and are often frightened of retaliation if they do report illegal activities. In effect, they are given much of the responsibility for protecting the NSMNP yet none of the support necessary to achieve this. All inhabitants of the park, not just the Agta, utilise and extract resources from it, so approaches which include all park residents need to be developed. Although the present study did not collect data on non-Agta's knowledge and perceptions, field assistants (who were local non-Agta) had to be trained on the NSMNP prior to fieldwork as they were not aware of park regulations. Protecting the NSMNP should not be solely the Agta's responsibility but rather all inhabitants of the park.

This is part of a more deep-rooted problem that the NSMNP is simply a 'paper park' and is not protected adequately (Minter 2010). The protected area status of the park is not taken seriously by its inhabitants and illegal activities are a frequent occurrence. Resources are regularly extracted illegally by the non-Agta, DENR and government officials; one reason the Agta rarely engage in these activities is because of financial restraints on purchasing the necessary equipment. This is made clear by one Agta who said that "poisoning and electric fishing happens by the non-Agta as the Agta do not have enough money to buy the poison". Corruption is rife in the Philippines (Transparency

493 International 2015). This is clear in the NSMNP (Minter 2010), and similar stories of political
494 corruption among park officials hindering the prevention of (or even participating in) illegal activities
495 were observed throughout the present study. One non-Agta woman discussed how she would not
496 attempt to stop someone illegally extracting resources because her husband wanted to become a
497 *barangay* official. This corruption and lack of political will urgently needs addressing, and methods
498 which provide either greater incentives or harsher punishments to prevent it need to be
499 implemented. If these issues are not addressed soon, the future of the NSMNP appears bleak and
500 the largest area of biodiversity in the Philippines, as well as the Agta's unique way of life, may be
501 lost.
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Ethics

Ethical clearance was granted by the University College London Ethics Committee (UCL Ethics code 3086/003). Fieldwork permission was granted by local government units, including the Mayors of the Municipalities visited and from the Department of Environment and Natural Resources (DENR) as the research took place in a protected area. Each Agta community agreed to participate and informed consent was obtained from all individuals.

Author contributions

A.B.M. conceived the project. K.M. and D.S. collected the data. D.S. and K.M. analysed the data. All authors wrote the manuscript, contributed substantially to revisions and gave final approval for publication.

Competing interests

We have no competing interests.

Funding

This research was supported by Leverhulme Trust grant no. RP2011 R045 (awarded to A.B.M).

Acknowledgements

We thank the Agta communities and field assistants for their help in the Philippines. Thanks also to Abigail Page and Mark Dyble regarding demographic data collection, and to Amanda Webber for helpful comments and feedback.

Data availability

The datasets analysed during the current study are available from the corresponding author on reasonable request.

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Table 1. Descriptive statistics for continuous variables (knowledge score, age and camp distance from main town) and binary variables (sex, chief, church and municipality). Individual-level variables (*n*=308) and camp-level variables (*n*=20) are also labelled.

Variable	**Variable level**	**Average**	**S.D**	**Minimum value**	**Maximum value**
Knowledge score	Individual	4.17	2.53	0	11
Age	Individual	36.57	14.5	14.62	78.32
Distance from main town (km)	Camp	14.8	6.79	1.88	28.9
		Number of cases			
Sex	Individual	Male=151; Female=157			
Chief	Camp	Chief=7; No chief=13			
Church	Camp	Church=4; No church=16			
Municipality	Camp	Palanan=13; Maconacon=7			

Table 2. Results of the multi-level model for variables predicting an individual's knowledge score (*n*=308, camps=20). Positive coefficients indicate an increase in knowledge score. Significant findings are highlighted in bold.

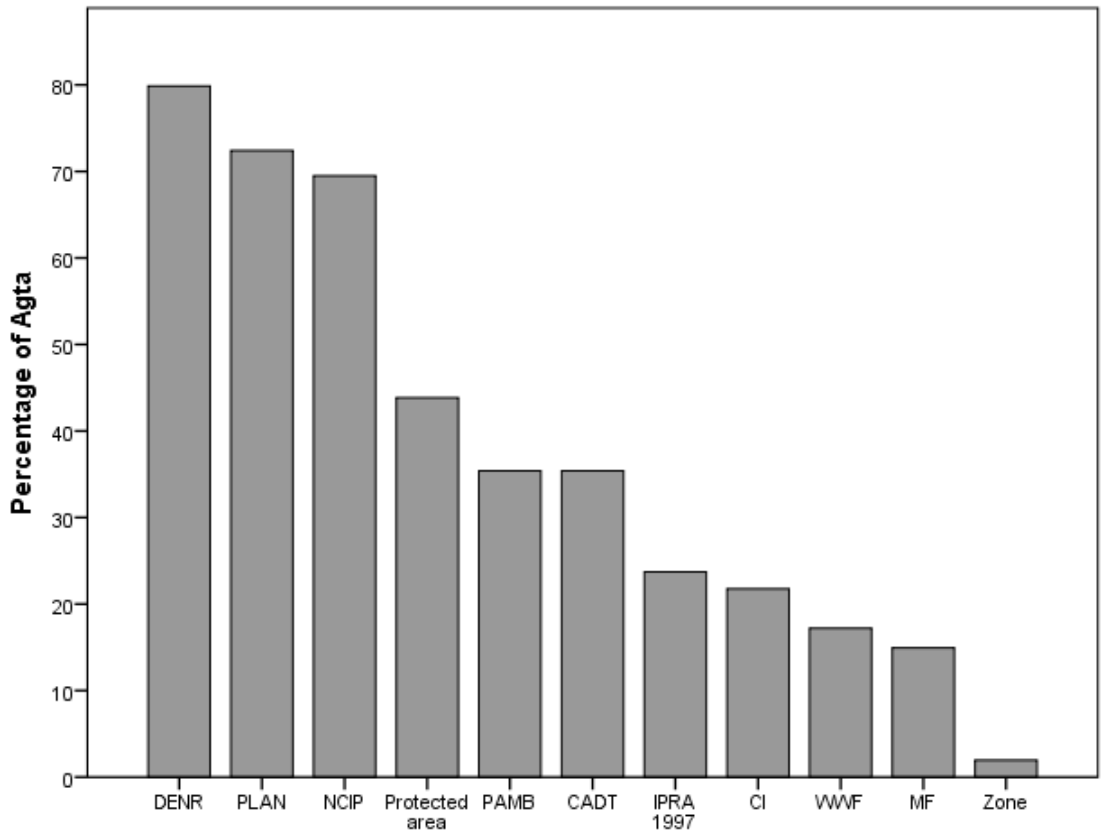
Variable	**Level**	**Coefficient**	**S.E**	**p-value**
Intercept	-	3.05	0.71	<0.001
Sex (ref=male)	Individual	**-0.83**	**0.23**	**<0.001**
Age	Individual	**0.05**	**0.01**	**<0.001**
Distance from main town (km)	Camp	**-0.09**	**0.03**	**0.003**
Chief (ref=no chief)	Camp	**1.23**	**0.46**	**0.007**
Church (ref=no church)	Camp	0.55	0.59	0.347
Municipality (ref=Palanan)	Municipality	0.82	0.48	0.088

Table 3. Results of the three logistic regression models predicting perceptions of park involvement. For reporting an illegal activity, a positive value indicates an increase in the likelihood of an individual identifying an individual or agency to report illegal activities to (*n*=299). A positive value for enough information indicates an increase in the likelihood of an individual perceiving that they have enough information on the park (*n*=202). A positive value for enough influence indicates an increase in the likelihood of an individual perceiving that the Agta have enough influence over park management (*n*=249). 'Reporting illegal activities' and 'enough park information' models are multi-level models, while the 'Agta influence over park decisions' model is a non-hierarchical regression (see text). Coefficients and standard errors (displayed in brackets) are log-odd estimates. Odds ratios are presented in text where significant. Significant findings are highlighted in bold. *P*-value codes: ·<0.01, *<0.05, **<0.01, ***<0.001.

Variable	**Reporting illegal activities**	**Enough park information**	**Enough Agta influence over park decisions**
Intercept	2.03 (1.18)·	-1.73 (0.79)*	1.21 (0.75)
Sex (ref=male)	0.78 (0.44)·	-0.48 (0.31)	0.5 (0.34)
Age	-0.01 (0.02)	0.01 (0.01)	0.01 (0.01)
Distance from main town (km)	-0.02 (0.05)	0.05 (0.03)	-0.03 (0.03)
Chief (ref=no chief)	1.36 (0.78)·	**0.98 (0.47)***	0.46 (0.4)
Church (ref=no church)	0.73 (1.05)	0.48 (0.59)	0.0 (0.51)
Municipality (ref=Palanan)	0.03 (0.71)	0.61 (0.52)	-0.25 (0.43)

Table 4. Logistic regressions predicting perceptions of park involvement based on an individual's knowledge score. A positive value indicates an increase in perceptions of involvement with increasing knowledge score for identifying an individual or agency to report illegal activities to (*n*=299), having enough information on the park (*n*=202), and the Agta having enough influence over park management (*n*=249). 'Reporting illegal activities' and 'enough park information' models are multi-level models, while the 'Agta influence over park decisions' model is a non-hierarchical regression (see text). Coefficients and standard errors (displayed in brackets) are log-odd estimates. Odds ratios are displayed in text where relevant. Significant findings are highlighted in bold. *P*-value codes: ˙<0.01, *<0.05, **<0.01, ***<0.001.

Variable	**Reporting illegal activities**	**Enough park information**	**Enough Agta influence over park decisions**
Intercept	1.8 (0.54)***	-1.86 (0.47)***	0.59 (0.35)˙
Knowledge score	**0.21 (0.11)***	**0.37 (0.08)*****	**0.21 (0.08)****



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712 *Figure 1.* Percentage of Agta respondents who knew each question asked in the knowledge survey
713 (questions=11; *n*=308). These questions asked about whether the Agta knew that they were living in
714 a protected area, what zone they were residing in, and had heard of agencies, policies and NGO's
715 which work in the protected area on conservation projects or to empower the Agta (DENR;
716 Department of Environment and Natural Resources: PLAN International: NCIP; National Commission
717 on Indigenous Peoples: PAMB; Protected Area Management Board: CADT; Certificate of Ancestral
718 Domain Title: IPRA 1997; Indigenous Peoples' Rights Act 1997: CI; Conservation International: WWF;
719 World Wide Fund for Nature: and MB; Mabuwaya Foundation).

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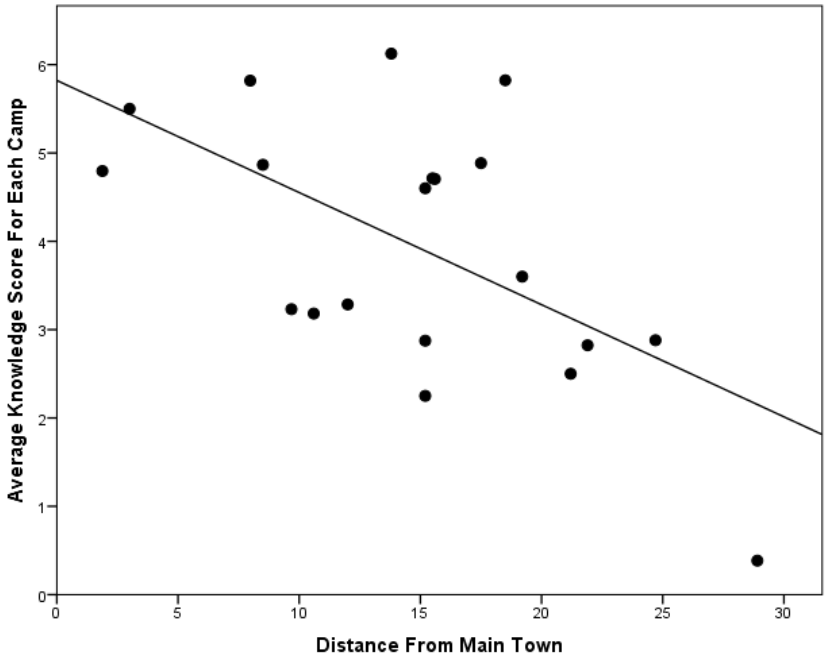

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722 *Figure 2.* Scatterplot displaying the relationship between the average camp knowledge score and

723 distance from main town (km; *n*=20). As distance to town increases, this is associated with a

724 decrease in knowledge about park rules and legislation.